Rotator Cuff Repair (RCR)
Arthroscopic vs Mini-open vs Open

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Steps in EBM

1. Ask
2. Acquire
3. Appraise
4. Apply
5. Act
The Question - PICO(T)

• **Population**: In adult patients with RC tear,
• **Intervention**: does arthroscopic repair
• **Control**: compared with open or mini-open
• **Outcome**: improve pain & functional outcome
• **Time**: for 5 to 10 years?
The 4S Approach by Haynes

- Systems
  - Computerised decision support systems (CDSS)
  - Evidence-based journal abstracts
- Syntheses
  - Cochrane reviews
- Studies
  - Original published articles in journals

Haynes, R B. Evid Based Med 2001;6:36-38
Search Strategy (4S)

• Sources:
  – Systems: UpToDate, Clinical Evidence → 0
  – Synopses: ACP Journal Club → 0
  – Syntheses: 3 Systematic Reviews
  – Studies: many, variable quality

• Terms: Rotator Cuff Tear
Syntheses (Systematic Reviews)

Ejnisman et al
Coghlan et al
Grant et al
Ejnisman et al, *CDSR 2006*

- Cochrane review: Interventions for tears of the rotator cuff in adults.
- Search to 2001
- 8 RCT & QRCT
- Only 2 arthroscopic vs. open
• **Ogilvie-Harris et al., JBJS(B) 1993:**
  – Quasi-randomized, Tear size (1-4 cm)
  – n=50, 90% available at 5 year

  – Comparison of UCLA Score:
    • Arthroscopic subacromial decompression & RC debridement vs. open repair and acromioplasty

  – Similar pain relief, active FF & satisfaction
  – Open: better function, strength & overall score
Ejnisman et al, CDSR 2006

- **Montgomery et al., JSES 1994:**
  - Quasi-randomized
  - n=88, 5 & 9yr

- Comparison of UCLA Score:
  - Arthroscopic subacromial decompression & RC debridement vs. open repair and acromioplasty
## No Improvement Overall Results (UCLA)

**Review:** Interventions for tears of the rotator cuff in adults  
**Comparison:** Arthroscopic subacromial decompression + debridement vs open repair and acromioplasty  
**Outcome:** No improvement overall results (UCLA)

<table>
<thead>
<tr>
<th>Study</th>
<th>Arthroscopic n/N</th>
<th>Open Repair n/N</th>
<th>Relative Risk (Fixed) 95% CI</th>
<th>Weight (%)</th>
<th>Relative Risk (Fixed) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montgomery 1994</td>
<td>15 / 38</td>
<td>11 / 50</td>
<td></td>
<td>82.9</td>
<td>1.79 [0.93, 3.45]</td>
</tr>
<tr>
<td>Ogilvie-Harris 1993</td>
<td>9 / 22</td>
<td>2 / 23</td>
<td></td>
<td>17.1</td>
<td>4.70 [1.14, 19.39]</td>
</tr>
</tbody>
</table>

**Subtotal (95% CI):** 24 / 60 vs 13 / 73  
Test for heterogeneity chi-square=1.53 df=1 p=0.2164  
Test for overall effect=2.75 p=0.006

<table>
<thead>
<tr>
<th>Study</th>
<th>Arthroscopic n/N</th>
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<th>Relative Risk (Fixed) 95% CI</th>
<th>Weight (%)</th>
<th>Relative Risk (Fixed) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montgomery 1994</td>
<td>23 / 25</td>
<td>6 / 27</td>
<td></td>
<td>100.0</td>
<td>4.14 [2.03, 8.46]</td>
</tr>
</tbody>
</table>

**Subtotal (95% CI):** 23 / 25 vs 6 / 27  
Test for heterogeneity chi-square=0.00 df=0  
Test for overall effect=3.89 p=0.0001

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Favours ASD  
Favours Open Repair
Ejnisman et al, *CDSR 2006*

- “….. Weak evidence for the superiority of open repair compared with arthroscopic debridement…..”
Coghlan et al, *CDSR 2006*

- Cochrane Protocol: Surgery for rotator cuff disease
- Awaiting results
Grant et al, *J Hand Ther* 2004

- Evaluation of interventions for rotator cuff pathology: a systematic review
- Search to May 2003
- 43 studies of surgical intervention
  - 41 case series (level 4 evidence)
  - 2 quasi-randomized (level 2b)
- Results: 9-pages table
Grant et al, *J Hand Ther* 2004

• “…the quality of the available evidence precludes drawing a conclusion about the advantage of one surgical intervention over another.”

• “….The results from Ogilvie-Harris et al indicated the advantage of open surgery when compared with arthroscopic surgery for patients presenting with a rotator cuff tear…”
Studies
Levels of Evidence
Therapy Trials

- Systematic Reviews and Meta-analyses
- Randomized Controlled Double Blind Studies
- Cohort Studies
- Case Control Studies
- Case Series
- Case Reports
- Ideas, Editorials, Opinions
- Animal research
- In vitro ('test tube') research
1. exp Rotator Cuff/ OR rotator cuff tear$.mp.
2. exp Arthroscopy/ OR arthroscop$.mp.
3. 1 and 2
4. Limit to 2003 to May Week 3 2006

238 citations → 28 relevant → 15 included
Kim et al, *Arthroscopy* 2003

- Retrospective cohort, Level 3
- n=76:
  - 42 arthroscopic
  - 34 mini-open "salvage" of failed arthroscopic
- Exclude <1cm, >5cm
- F/U: mean 39 months
- Results:
  - No statistical difference in postoperative UCLA & ASES
  - Large tears had lower postoperative scores
<table>
<thead>
<tr>
<th>Patient Satisfaction</th>
<th>Patient feels procedure was not successful</th>
<th>Patient feels procedure was a success</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Forward Flexion Ranges of Motion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>&lt;30°</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>30°–45°</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>45°–90°</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>90°–120°</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>120°–150°</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>&gt;150°</td>
<td></td>
</tr>
<tr>
<td>Strength of Forward Flexion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>No active contraction</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Evidence of slight muscle contraction, no active elevation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Complete active forward flexion with gravity eliminated</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Complete active forward flexion against gravity</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Complete active forward flexion against gravity with some resistance</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Complete active forward flexion against gravity with full resistance</td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Present always and unbearable; strong medication, frequently</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Present always, but bearable; strong medication, occasionally</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>None or little at rest, present during light activities; salicylates, frequently</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Present during heavy or particular activities only; salicylates, occasionally</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Occasional and slight</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Unable to use limb</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Only light activities possible</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Able to do light housework or most activities of daily living</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Most housework, shopping, and driving possible; able to do hair and to dress and undress, including fastening buttons</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Slight restriction; only able to work above shoulder level</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Normal activities</td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>34–38</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>28–33</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>21–27</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>0–20</td>
<td></td>
</tr>
</tbody>
</table>
Severud et al, *Arthroscopy* 2003

- Retrospective cohort, Level 3
- n=64 shoulders:
  - 29 mini-open trans-osseous sutures
  - 35 arthroscopic metal bone anchors
- >5cm tear excluded
- F/U: minimum 24 mo, average 44 mo
- Results:
  - Large tears (3-5 cm): 9 in arthroscopic vs 18 in mini
  - No statistical difference UCLA score at final F/U
  - Stiffness 14% in mini-open
Sauerbrey et al., *Arthroscopy* 2005

- Retrospective cohort, Level 3
- n=54
  - 26 mini-open trans-osseous sutures
  - 28 arthroscopic suture anchors
- F/U: 33 mo mini, 19 mo arthroscopic
- Modified ASES scores
- Results:
  - Tear Size: 2.7 (1-8) cm² mini, 2 (1-12) cm² arthroscopic
  - Significant improvement within each group
  - No difference between the two groups
Ide et al., *Arthroscopy* 2005

- Retrospective cohort, Level 3
- n=100 (50 mini-open, 50 arthroscopic)
- F/U: mean 49 months
- Results:
  - Similar pre-op tear size, duration symptoms, UCLA and JOA scores
  - No statistical difference in scores between two groups
  - Inferior outcome in large tear group compared to small/medium group, regardless of intervention
Youm et al., JSES 2005

• Retrospective cohort, Level 3
• n=84 (24 mini-open, 24 arthroscopic)
• F/U: 37.6 mo in mini, 35.2 mo in arthroscopic

• Results:
  – Large (3-5cm) tears: 2 in mini, 12 in arthroscopic
  – Similar post-op UCLA and ASES
  – 3 re-operations in each group
Buess et al., *Arthroscopy* 2005

- Retrospective cohort, Level 3
- n=96 patients:
  - A: Before Feb 2000: 30 open (12 classic, 18 mini)
  - B: After Feb 2000: 66 arthroscopic suture anchors
- F/U: 15-40 months
- Outcomes: VAS, Simple Shoulder Test, Satisfaction

- Results:
  - Similar tear size, pre-op pain
  - Significant pain relief in arthroscopic
  - No significant difference in SST or satisfaction
Warner et al., *Arthroscopy* 2005

- Retrospective cohort
- \( n=21 \) (12 mini-open, 9 arthroscopic)
- F/U: minimum 27 mo
- Simple Shoulder Test
- Results:
  - No significant difference in overall SST
Chhabra et al, *Arthroscopy* 2005

- In vitro cadaveric study
- Full-thickness 1 x 3-cm rotator cuff defects were created in 25 fresh-frozen cadaveric shoulders
- Randomized to 1 of 4 repair groups:
  1. open repair with trans-osseous sutures
  2. arthroscopic with 2 singly loaded suture anchors
  3. arthroscopic with 2 doubly loaded suture anchors
  4. arthroscopic with cuff tacks
Chhabra et al, *Arthroscopy* 2005

- Repairs were cyclically loaded from 10-180 N
- Numbers of cycles to 50% (5-mm gap) and 100% (10-mm gap) failure were recorded

Results:
- The number of cycles to 100% failure was significantly higher for the arthroscopic doubly loaded suture anchor repairs compared with other repairs
- The number of cycles to 50% failure was significantly higher for all anchors versus open or tack repair
Chhabra et al, *Arthroscopy* 2005

• Conclusions:
  – Superior immediate postoperative fixation of RCR may be achieved with the doubly loaded suture anchors.
  – However, additional evaluation is needed to examine the effects on the sustained strength of the repair throughout the healing process.
Wolf et al, *Arthroscopy* 2004

- Case series of arthroscopic repairs
- Single surgeon experience
- 1990 to 1996
- 105 repairs → 96 available for follow-up
- F/U: 4-10 years
- 98% of patients: good to excellent result according to the UCLA shoulder score
So what is the best option?
MacDermid et al., BMC Musculoskeletal Disorders 2006

- Protocol of a randomized, multi-center, national trial
- JOINTS Canada
- Proposed sample 250
- Arthroscopic vs mini-open
- Validated outcomes
- Recruitment for 2 yr, follow-up 2 yr
- Will have the answer in 5 years
Thank You